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STUDY OF BODY MEASUREMENTS FOR SIZING  
CHILDREN'S GARMENTS AND PATTERNS

MANUAL OF MEASUREMENTS

Bureau of Home Economics  
United States Department of Agriculture  
Washington, D. C.

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## CONTENTS

	Page
General instructions.....	2
Instruments and equipment.....	3
Body landmarks.....	9
Order of placing landmarks.....	10
Description of landmarks and placement.....	14
Measurements.....	25
Appendix.....	38

## GENERAL INSTRUCTIONS

Squad members who set landmarks and take measurements are urged to wear laboratory coats, nurse's uniforms, or smocks.

Squad members placing points and measuring must arrange their work in relation to the light source so that the light falls without obstruction upon the areas to be observed.

Care is necessary if measurements are to be taken without mishap. The wooden anthropometer is equipped with a sharp brass point which will injure a child if it is scraped against the skin. The position of the point should be observed particularly when raising rapidly before the chest and head for reading stature. The points and edges of the sliding caliper have been rounded but they can still mar the skin if allowed to scrape the underarm and shoulders when locating the midpoint of the underarm. The steel tape has sharp edges and should never be slid over the body when held taut. Before the spring is released to re-roll the tape, the tape should be entirely free from the part measured. Pencil points are to be kept sharpened but no increase in accuracy will result from points which are so needle-like that the child squirms when the pencil is felt. Finger nails are to be cut short and blunt.

When measurements on a child are completed, the nursery aide shall be instructed to remove the landmarks with cold cream and a cotton swab. A cotton swab used for one child shall be used for no other child. Used cotton swabs shall not be dipped in the common cold cream container. If desired alcohol may be used to clean off the cold cream.





## INSTRUMENTS AND EQUIPMENT

Each measuring squad, consisting of one person setting landmarks, one person measuring between landmarks, and several NYA aides, will require the following instruments and equipment:

- 1 portable wooden leveling platform
  - 2 wooden anthropometers
  - 1 protractor head
  - 1 sliding caliper
  - 1 portable weighing scales
  - 1 2-meter steel tape with spring release
  - 1 2-meter linen tape with spring release
  - 4 skin pencils
  - 2 neck chains
  - 1 steel knitting needle
  - Carpenters' chalk and spool of twine
  - Cold cream, cotton and rubbing alcohol
  - Pocket knife
  - Receptacle for disposing of cotton swabs
  - Schedules 1.
  - Clothing for subjects (trunks and brassieres)
  - 1 instrument case
  - 1 table and chair for recorder
  - 1 table and chair for nursery aide
  - 2 additional chairs of ordinary height
  - 1 child's chair or bench
- Additional chairs or a long bench on which children who are waiting can be seated, will be found useful.





In Appendix I will be found the catalogue numbers of the principal instruments and sources from which they can be obtained.

Leveling platform.

This platform is 2 feet by 3 feet, made of 5 ply board with battens, four set screws and two levels. It is to be used when taking stature and height above the floor of cervicale, the waist, hips, the crotch, and the tibiale. It should also be used when measuring slope of shoulder. The leveling platform will aid in taking accurate measurements in situations where the floor is pitched, corrugated or pitted. It is to be used regularly for the measurements specified. The platform can be leveled readily by means of the set screws in the four corners and the spirit levels on the two sides. The platform must not be exposed to excessive heat or moisture and must not be carried about uncovered in inclement weather. Floors which are found, on test, to be level, may be measured from directly without using the platform.

Wooden anthropometer.

The wooden anthropometer consists of two meter sticks which can be joined by a brass dowel and a wooden key to prevent twisting. The upper stick has a fixed horizontal arm at the top and a sliding horizontal arm with a reversible and tapered brass point. The horizontal arms are braced with brass corner triangles. The sliding arm is provided with a lower brass collar which helps to hold it horizontal to the long shaft and is also used to indicate readings on the metric scale of the long shaft. The long shaft is calibrated in English and metric system. The former must be ignored. The two metric scales on



opposite sides of the long shaft have zero points at opposite ends of the shaft so that the full anthropometer can be used to measure between the horizontal arms.

When height from the floor is measured, the straight side of the brass point is directed to the floor, and the reading is made at the lower beveled edge of the brass collar directly in line with the point of the straight edge of the brass point piece. When the distance between the horizontal arms is measured, as for breadth of hips, the brass point piece is reversed so that the straight edge faces the opposite horizontal arm, and the reading is made at the upper beveled edge of the brass collar which is now in line with the straight edge of the brass point piece.

Height of lower points, such as tibiale, hips and waist can be measured on young children with the upper section of the anthropometer only, by standing this piece upside down, with the fixed horizontal arm resting on the platform floor. The straight edge of the brass point is directed away from the floor and the reading must be taken at the beveled edge of the brass collar at the underside of the movable cross arm in order to subtract the  $5/8$  inch added by the fixed horizontal arm.

If left in excessively hot places, near radiators and steampipes, or in damp places, the anthropometers will warp. They will also warp if left leaning against walls or other supports. Therefore measurers are urgently requested to protect the wooden instruments from dampness and



heat and when not in use to keep them fastened in the instrument cases. When measuring in the field a nail should be provided at a suitable height, on which the anthropometer can be hung. The hole in the brass triangle of the fixed arm is intended for this purpose.

Despite all precautions, the anthropometers may warp. Measurers are requested to ship such instruments to this Bureau, which will provide replacements. When the anthropometer is first received, several test heights from the leveling platform should be indicated by the instrument on a wall which can be conveniently referred to. The height of each mark should be labeled. At intervals the instrument can be checked against these markings. If the correspondence is poor and the shaft is noticeably warped, the indications are that another instrument is needed.

#### Protractor head.

This instrument is a craftsman's tool. It is used in the present study to measure slope of shoulder line. The frame in which the protractor is set is equipped with a wooden guide piece which is to be rested on the intersections of the shoulder line with the neck base and the armscye. The revolving protractor carries a spirit level which when set in a horizontal plane permits one to read directly from the protractor scale the acute angle formed by the shoulder line with the horizontal plane.

#### Sliding caliper.

The caliper is also a craftsman's tool. It is to be used to find the midpoint of the armscye under the arm. It should be noted that the zero point of the scale is 3.5 cm away from the inside margin of the fixed jaw. Readings are made at the first line marked to the right on





the sliding jaw. This gives the distance between the jaws. The point on the shaft which bisects this distance is 3.5 cm to the left of the arithmetic half of the given reading on the scale.

#### Portable weighing scales.

The scales provided are accurate to approximately 0.5 lb. A determination of the error of each scale will be given by the Bureau of Standards. Each weighing scale is provided with a set screw with which the calibration can be set at zero before the subject is weighed. This adjustment is of great importance if the error of the scales is to be kept at a minimum. Children must also stand quietly and in the middle of the platform on these scales.

#### Tapes.

The pocket tapes are all provided with a spring release for rewinding. The calibration of one side of the tapes is metric and of the other side, English system. The metric calibration only will be used. When measuring girths, if the tape case is held in the right hand with the button of the spring release toward the floor the metric side will always be directed toward the measurer. When measuring linear distances, the metric scale will be toward the observer if the case is held in the right hand with button away from the floor. The linen tapes are intended for children who will not stand quietly when the steel tape is used and they are recommended in cold weather for all children. They should be checked occasionally against the steel tapes.

#### Neck chains.

The neck chains are fine gauge, small link chains which are long enough





to pass around the neck with ends crossed over at the back and hanging free down the sides of the neck toward the front. If the middle of the chain is placed at the center front the hanging ends will balance one another and the chain can be readily adjusted to the size of the neck base.

Steel knitting needle.

The needle used by the Bureau is 2 mm in diameter and about 30 cm long.

It can be purchased at any notion store. It is useful to indicate the direction of certain straight lines to be marked on the body.

Pencils, chalk and twine will be provided by the Bureau upon request.

Pocket knives are specified for sharpening skin pencils in the field.

Clothing.

Clothing worn by the children during measurement must conform to specifications given by the Bureau. Boys and girls will wear "gym knit scants." These are small cotton pants with lastex at the waist, and cut high on the thigh where they should fit loosely. Older girls will wear a non-binding uplift brassiere as well. Garments which have been worn once are to be laundered before they are issued to a second child. A smaller outlay for clothing will be required if children of several ages are measured in one day and if laundry is done more than once a week.

Instrument case.

An instrument case will be provided which will carry conveniently and safely all of the instruments required by one measuring squad.



## BODY LANDMARKS

Body landmarks which will serve as points of reference for the measurements are to be located on each subject by the leader of the measuring squad. They are to be marked on the body with skin pencils provided for this purpose. Pencils are to be kept sharpened to a point so that they will draw a clear, narrow line.

The landmarks are divided into five general classes, according to the position of the subject in relation to the observer.

Subject facing the observer.

Subject with back turned to the observer.

Subject with right side turned to the observer.

Subject with left side turned to the observer.

Miscellaneous positions.

This grouping is recommended because it permits systemization and results in an economy of effort which reduces the time required of the subject. It is in the interest of accuracy as patience and fatigue of both the observer and subject are factors which will affect the precision of placement. Whether the relative position of the subject to the observer is changed by moving the observer or the subject will depend upon the situation. Greater speed is possible if the observer moves in relation to the subject. However, standing for even two or three minutes is a strain for most children and better results will be obtained if they are permitted to move about. An equal division is recommended as a general rule.



The squad leader should study each child in the course of locating landmarks and attempt to gauge the extent to which she can call upon him to stand in a given position with stability. Any indication of unsteadiness is a sign that the child should be permitted more freedom and motion. Better results will be obtained with such a child in the brief intervals when immobility is required if he is given the opportunity to move when landmarks are not being located. In some cases, to avoid strained and fatigue postures, it is necessary to instruct the child to walk about or sit down. Every effort should be made to preserve the posture which is normal for the child.

#### Order of placing landmarks

##### Subject facing the observer.

1. Upper border of the medial ends of the clavicles, right and left.

Figure 1.

2. Point in the median sagittal plane at the level midway between the shoulder point of the armscye and the point of lowest extension of the armscye Figure 1.

3. Distal end of the ulna, right. Figures 1 and 3.

4. Waist level, right (Figure 3) and left sides.

##### Back of the subject turned toward the observer.

5. Cervicale. Figures 2 and 3.

6. Midpoint of the processus spinosus of the fourth thoracic vertebra.

Figure 2.

7. Olecranon, right. Figures 2 and 3.

8. Akromion, right and left. Figures 1 and 3.

9. Highest prominence at the lateral end of the clavicle, right and left. Figure 1.





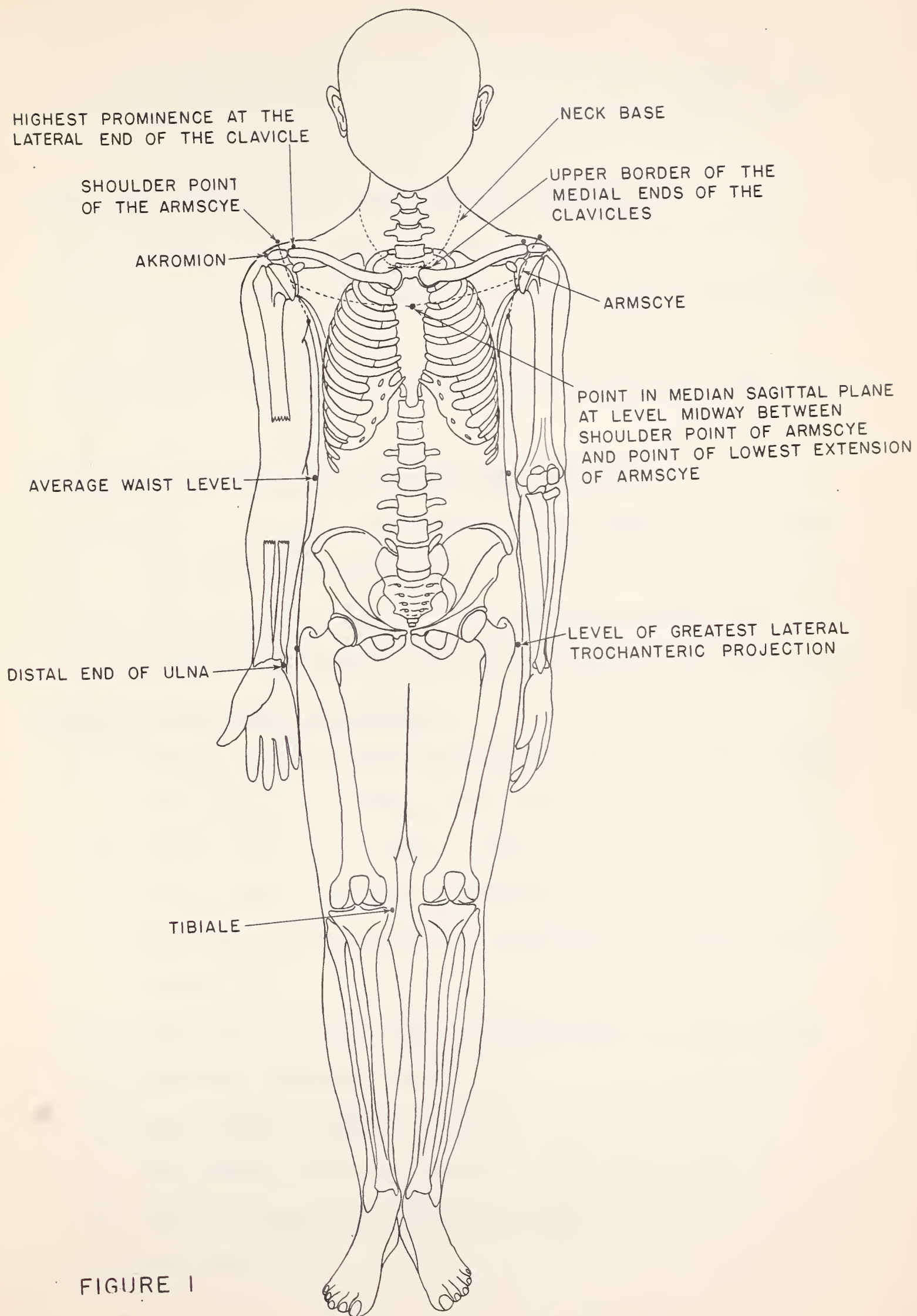


FIGURE 1



10. Shoulder point of the armscye, right and left. Figures 1 and 2.
11. Midpoint of the posterior surface of the knee, in the major crease of flexion, right. Figure 2.

Right side of the subject turned toward the observer.

12. Tibiale, right. Figures 1 and 2.
13. Level of maximum chest girth (girls more than 8 years old and boys more than 9 years old).
14. Level of greatest lateral trochanteric projection, right. Figures 1, 2 and 3.

Left side of the subject turned toward the observer.

15. Level of maximum chest girth (girls more than 8 years old and boys more than 9 years old).
16. Level of greatest lateral trochanteric projection, left.
17. Midline of the medial surface of the thigh at the crotch level.

Subject in miscellaneous positions.

18. Average level of maximum chest girth (girls more than 8 years old and boys more than 9 years old).
19. Average level of the waist. Figure 1.
20. Average level of maximum trochanteric girth.
21. Midpoints of the right side at trochanteric and waist levels.  
Figure 3.
22. Midpoints of the left side at trochanteric and waist levels.
23. Neck base. Figures 1 and 2.
24. Right armscye. Figures 1 and 2.
25. Left armscye. Figures 1 and 2.
26. Underarm midpoint of the armscye, left.
27. Trunk line, left.



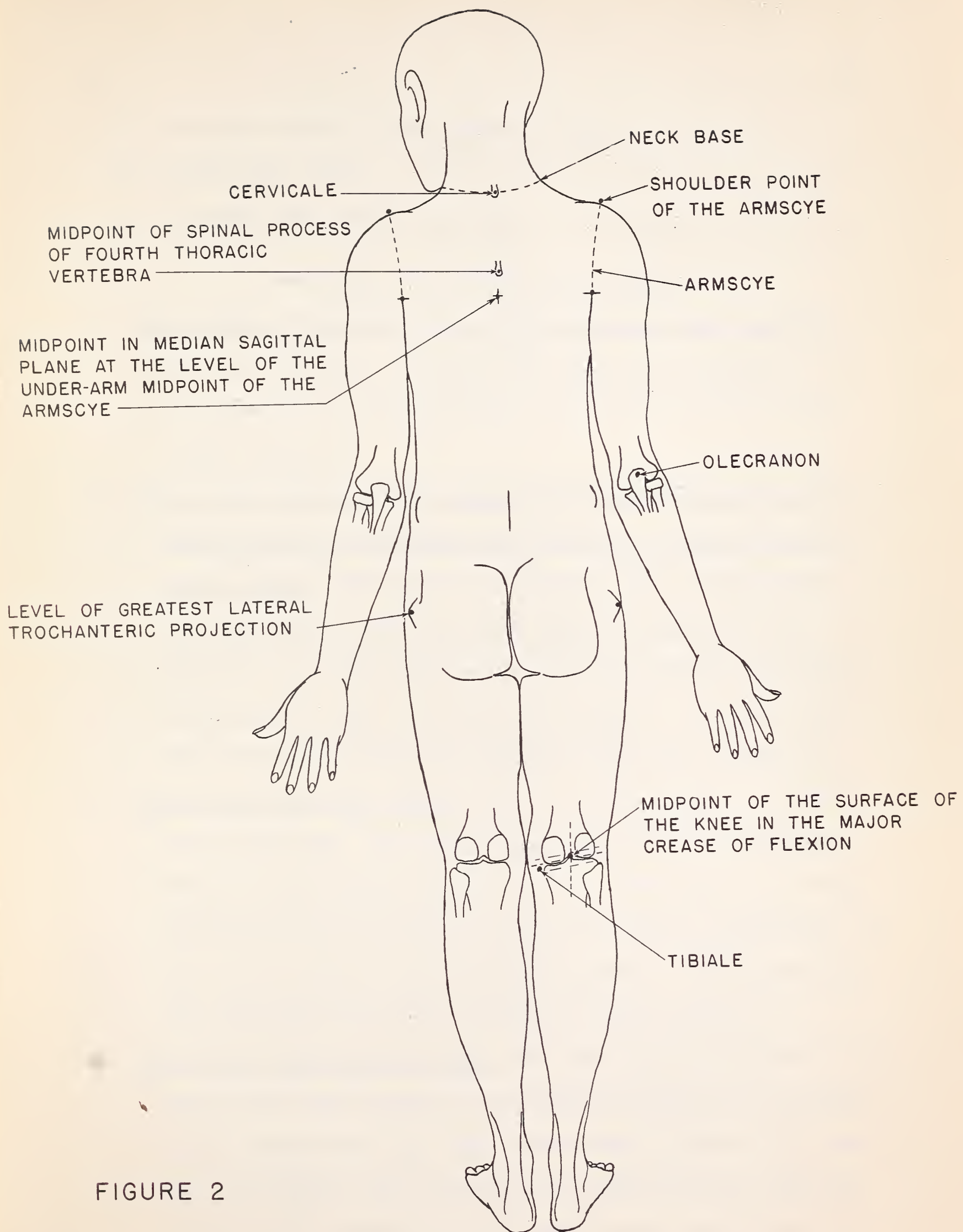


FIGURE 2





- 28. Underarm midpoint of the armscye, right.
- 29. Trunk line, right.
- 30. Shoulder line, right.

#### Description of landmarks and placement

1. Upper border of the medial ends of the clavicles, right and left.

The upper border can be readily distinguished by palpation. It is marked with a short horizontal line for both right and left bones. Figure 1.

2. Point in the median sagittal plane at the level midway between the shoulder point of the armscye and the point of lowest extension

of the armscye. This point is located by sight. The observer sits with eyes at chest level and judges the position of the midpoint of the scye-depth as seen when the subject's arms hang loosely at the sides. The level of the point is indicated by a short line intersecting the median sagittal plane. Figure 1.

3. Distal end of the ulna, right. This is the most distal and lateral point of the ulna. The flat of the thumb nail of the observer should be pushed upward against the end of the ulna but not with sufficient force to scarify or arouse the child's apprehension. A thin line is used to mark the distal extension. An intersecting line marks the most lateral position. Figures 1 and 3.

4. Waist level, right and left sides. The waist level is defined in this study as the lower border of the lowest rib which can be palpated in the mid-axillary line. The observer sits in front of the subject and palpates right and left sides simultaneously, using the index fingers pressed against the sides in the mid-axillary line.





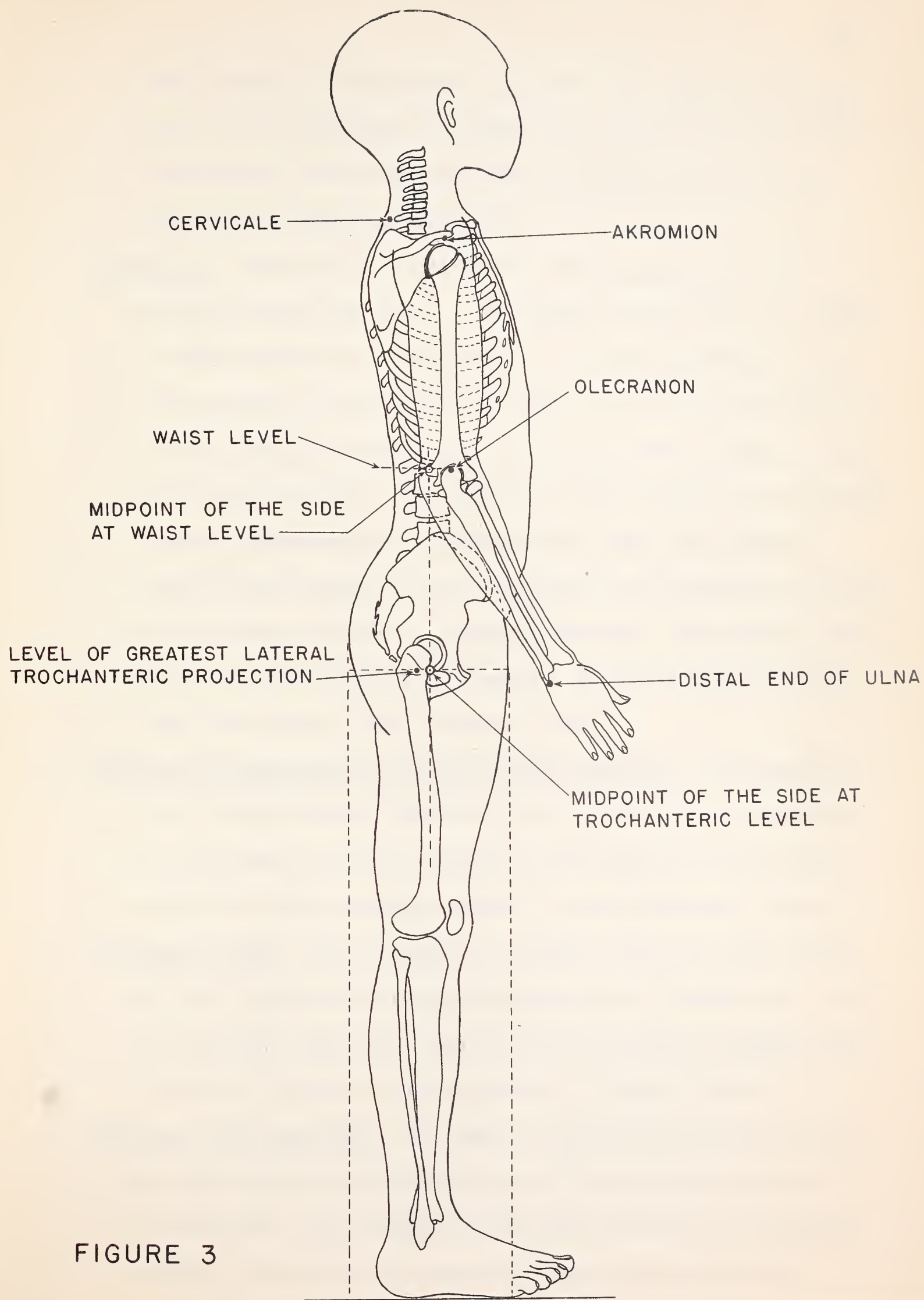


FIGURE 3



The direction of the pressure is medial. The level of the mid-line of the index finger is marked with a short horizontal line intersecting the mid-axillary line. The waist level of the right side is shown in figure 3.

5. Cervicale. Cervicale is the midpoint of the prominence of the seventh cervical vertebra. In clothiers' terminology it is known as the "socket bone." The seventh is the most prominent vertebral process, at the base of the neck. It is to be indicated by a cross placed centrally on the prominence when the head is held in an erect position. The identity of the process of the seventh cervical vertebra can be established by asking the subject to drop his head forward, which accentuates the prominence and shows it in clearer relation to adjacent vertebrae. The seventh cervical is the most superior prominence. The point must be marked while the head is erect. Figures 2 and 3.
6. Midpoint of prominence of fourth thoracic vertebra. The prominence of the fourth thoracic vertebra is the fourth by count below that of the seventh cervical vertebra. The midpoint is to be indicated by a cross centrally located on the prominence. Figure 2.
7. Olecranon, right. The olecranon in everyday language is the elbow. The point of greatest projection posteriorly is marked with a dot of the pencil when the forearm is fully flexed and the posterior surface of the arm is seen in profile. Figures 2 and 3.
8. Akromion, right and left. The akromion is defined in this study as the most laterally projecting point of the acromial process of the scapula. The lateral border of the process at the shoulder level is identified by pressing the thumb nail against the



border. The most lateral point is judged by palpation, It steadies the subject if the right and left borders are palpated simultaneously. The direction of the border is indicated by a line. The point of greatest lateral extension is indicated by the intersection of this line with a second at right angles to it. Figures 1 and 3.

9. Highest prominence of the lateral end of the clavicle, right and left.

This landmark is a region rather than a point. The observer places his eye at the shoulder level of the subject and directly behind the shoulder concerned. The highest point on the shoulder profile at the lateral end of the clavicle is marked with the pencil point. Figure 1.

10. Shoulder point of the armscye, right and left. The subject stands looking down on the akromion and lateral clavicular point of the shoulder concerned. The shoulder point of the armscye is placed midway between the akromion and the point at the lateral end of the clavicle. Figures 1 and 2.

11. Midpoint of the posterior surface of the knee, in the major crease of flexion, right. The median line of the posterior surface is indicated at the back of the knee with a short, vertical line intersecting the major crease of flexion. The level of the major crease in the median line is to be indicated by a short horizontal line. Figure 2.

12. Tibiale, right. Tibiale is the highest point of the medial border of the tibia (shin bone), when the subject stands erect. To find the point, one presses the pad of an index finger into the "cleft" at







the articulation of the femur and tibia. The "cleft" will be found to be obscured by ligament and muscle and frequently by fat pads as well. The position of the point can be judged more readily if the subject alternately flexes and extends his knee slightly while raising the heel from the floor. The level of tibiale is marked with a thin horizontal line. Figures 1 and 2.

13. Level of maximum chest girth, right (girls more than 9 years of age and boys more than 10 years of age). The observer places his eyes at the level of the chest and observes the anterior and posterior contours in full profile. A horizontal mark is placed on the anterior profile at the level which is judged to be that of the greatest girth. Hollow-backed children with winged scapulae usually can be judged more satisfactorily by the posterior profile, whereas the anterior profile is of greater importance in the case of children with straight backs. When judging the level, both profiles are to be considered.
14. Level of greatest lateral trochanteric projection, right. The observer places his eyes at the level of the hips. The observer's left hand is used to brace the left side of the subject's body and the index and middle fingers of the right hand are used to palpate the region of the trochanter of the femur. When the lateral fat pads of the hips are well developed, the most lateral prominence of the femur in this region cannot be readily identified. The subject should be asked to bend the trunk forward slightly and then to stand erect to assist the observer in finding the point. A short horizontal line is used to indicate the level of greatest lateral projection. Figures 1, 2 and 3.



15. Level of maximum chest girth, left (girls more than 9 years of age and boys more than 10 years of age). This level is determined on the left side in a manner identical to that of the right side.
16. Level of greatest lateral trochanteric projection, left. To be determined and marked as on the right side. Figures 1 and 2.
17. Midline of the medial surface of the right thigh at crotch level.  
The subject is asked to place his left foot on a chair. The observer squats at the side of the subject with his eyes at the level of the gluteal fold and directly in front of the medial surface of the thigh. The subject's right foot must be directed straight forward. The median transverse plane of the thigh is sighted and marked by a thin vertical line extending downward from the perineum. If the lower border of the pants obscures the region, the subject should be asked to draw them up by lifting them at the outer right side.
18. Average level of maximum chest girth (girls more than 9 years old and boys more than 10 years old). Using the anthropometer, the heights from the floor of the markings on right and left sides, indicating the level of the maximum chest girth, are measured while the subject stands on the level platform. The heights are averaged by the recorder. The sliding arm of the anthropometer is set at the average height and then used to indicate at center front and back the average level.
19. Average waist level. The heights from the floor of the waist marks are measured and averaged as for maximum chest level. The average is marked at the center front and back by crosses. The level at



the center of the left and right sides is to be marked by a horizontal line. If this does not exactly coincide with the marks previously placed, the final mark is to be distinguished by a tail mark which drops down from one end. (The tail mark is to be used throughout to distinguish final or corrected landmarks.) The average waist height is also marked midway between center back and center right side, with a horizontal line. Figure 1.

20. Average level of maximum trochanteric girth. The average level of maximum trochanteric girth is measured and calculated in the same manner as average waist and maximum chest girth. The level is to be marked by a thin horizontal line on the right and left sides.
21. Midpoints of the right side at trochanteric and waist levels. The subject's position should be his normal posture with feet directed straight forward. The midpoint of the hip at the side is sighted. The observer places his eyes at the level of the head of the femur and at the center of the right side. His attention is directed to the distance between two imaginary planes, both perpendicular to the floor. One is tangent to the buttocks and the other to the anterior surface of the thighs. The line midway between these planes is marked where it intersects the horizontal line indicating the level of greatest lateral trochanteric projection. The bisecting line is projected upward and its intersection with the waist level is marked by a vertical line. The shaft of the anthropometer is used to aid the eye in projecting the line from hip to waist level. Figure 3.





22. Midpoints of the left side at trochanteric and waist levels. These points are sighted and marked in the same manner as on the right side.
23. Neck base. The neck base is outlined by the neck chain adjusted so that posteriorly it rests on cervicale and anteriorly on the upper borders of the medial ends of the clavicles. The chain, so placed over three points, takes a curved position on either side of the neck. The line of the neck base is marked in the center front and at the center of both right and left sides. Figures 1 and 2.
24. Armscye, right. The subject is asked to raise the right arm about  $30^{\circ}$  from the trunk. A chalked string 24 inches in length is passed under the arm and drawn upwards until the string meets the underarm. Very slight tension should be used. If no tension is used almost no mark will be made and if the tension is too great the marks will appear too deep in the armpit. The ends of the string are then drawn up over the shoulder and crossed over the armscye point. The ends of the string can be pulled firmly in opposite directions. The string is then uncrossed and the subject is again asked to raise his arm. The whole string is dropped directly downward to try to avoid blurring of underarm markings. The chalked line is marked in with pencil over the top of the shoulder and in front and in back.

The observer then sits in front of the subject, raises his arm to the horizontal and considers the chalk markings obtained under the arm. These are usually not clear-cut and are ordinarily





double if not triple, one or more on the anterior surface of the arm and one or more on the trunk. It is necessary to study these in relation to the subject's natural creases in the axillary fossa and in relation to the measurer's knowledge of what happens to margins of the sleeve and blouse in the axillary fossa. Material is not provided to cover the full surface of the fossa when the arm is extended horizontally from the shoulder. This would result in an accumulation of material under the arm. The coverage is provided by lifting the garment with the arm from the waist and the sleeve riding up from the wrist. It is accordingly not desirable for the chalk line of the arm and the trunk to be in an identical position. In practice in the Bureau they have been found to fall 2-3 cm apart.

The observer is called upon to judge for the individual case, according to the depth of the fossa, and the natural creases of the individual, how far apart the lines on arm and trunk can lie when the arm is extended directly out from the shoulder. It should be provided, however, that when the arm is lowered to the side, the arm and trunk lines shall correspond. It is also essential that the armscye line of the trunk be placed at the same height from the floor on the right and left sides. The relative position of the right and left armscye lines of the trunk is to be judged while the observer sits in front of the subject and the subject's arms are extended horizontally and laterally in line with the shoulder.

25. Armscye, left. The left armscye is located in the same manner as the right armscye. It is necessary to mark only the front and



back chalk lines and the underarm levels.

26. Underarm midpoint of the armscye, left. The observer sits at the left side of the subject. The subject's position is his normal posture with feet directed straight forward. The subject extends his arm outward horizontally from the shoulder. The arm can be rested lightly on the head of the observer. With very small children, the observer will find the floor an easier place to measure from unless the child is seated on a chair higher than his own. The long arm of the sliding caliper is placed against the trunk and up in the axillary fossa at the level of the armscye line of the trunk. The long arm is parallel to the floor. The jaws are closed lightly against the shoulder, front and back. The point midway between the jaws is marked on the armscye line of the trunk.
27. Trunk line, left. The upper end only of the line is drawn on the trunk on both sides of the body between the midpoint of the armscye and the center side point of the average waist level. The line should be passed vertically downward but in some cases of winged scapulae and hollow backs, the line is inclined from the vertical position.
28. Underarm midpoint of the armscye, right. This point is located in the same manner as for the left side.
29. Trunk line, right. This point is located in the same manner as for the left side.
30. Shoulder line, right. The shoulder line follows the anterior border of the trapezius muscle and passes through akromion. The border



of the trapezius muscle can be identified if the subject is asked to raise his shoulder toward his ear. The knitting needle is used to show the direction of the line along the border and through akromion. The intersections of the shoulder line with the neck base and the armscye are marked on the right shoulder only.





## MEASUREMENTS

Measurements between landmarks are to be taken by a second trained member of the squad. They are listed here in the order in which they are to be taken. The order is based partially on economy of time and partially upon the notion of taking first those measurements in which total and non-fatigue postures are of great importance to accuracy.

1. Average height of waist from the floor.

Read to recorder at the time of marking average level of waist.

2. Height of trochanteric girth from the floor.

Read to recorder at the time of marking average level of greatest lateral trochanteric projection.

3. Weight.

This is the first measurement after the landmarks are placed. The bladder should be emptied before the child presents himself for measurement.

4. Standing height.

Instrument.- Anthropometer, leveling platform.

Position of subject.- On the leveling platform placed against a flat wall. The subject stands with heels against the wall, and together. Shoulders and buttocks just touch the wall. Eyes are directed forward and head is erect. Hands clasp the thighs.

Position of observer.- At the subject's right side. The anthropometer is held and balanced in the right hand. The left hand palpates the vertex of the head. The right hand slides the moving arm of the anthropometer down to rest on the vertex. The straight side of the brass point piece is toward the vertex.



5. Height of cervicale from the floor.

Instrument.- Anthropometer, leveling platform.

Position of subject.- Identical to No. 4, but away from the wall.

Position of observer.- To the left side and in back of the subject.

Procedure.- The observer holds the anthropometer vertical in his right hand in the median sagittal plane and lowers the moving arm to the height of cervicale. The straight side of the brass point piece is toward the floor. The measurement must be taken quickly as the child cannot be expected to stand more than a few seconds without swaying.

6. Height of tibiale from the floor.

Instrument.- Anthropometer, upper end; leveling platform.

Position of subject.- The subject places his left foot on a chair which raises the foot to his knee height. His right foot is directed straight forward. If possible, the leveling platform is used.

Position of observer.- The observer squats at the subject's left side with eyes at knee level.

Procedure.- Upper section of the anthropometer is inverted so that it stands on the fixed arm. The straight side of the brass point piece is directed away from the floor. The point is raised to the level of tibiale. The reading is taken at the lower margin of the brass collar.

7. Height of the crotch from the floor.

Instrument.- Anthropometer, upper end; leveling platform.

Position of subject.- Identical to No. 6.

Position of observer.- Identical to No. 6.



Procedure.- The straight side of the brass point piece is directed toward the crotch, and the brass piece is raised in the midline of the crotch until the straight side rests against the crotch without pressure. The reading is taken as in No. 6.

8. Width of hips.

Instrument.- Anthropometer, upper end.

Position of subject.- As in No. 4, except away from the wall and with hand resting on the hips. The weight is distributed equally on both feet.

Position of observer.- The observer stands in front of the subject.

Procedure.- The straight side of the brass point of the moving arm faces the fixed arm of the anthropometer. The shaft and arms of the anthropometer lie in a plane parallel to the floor. The jaws are closed without pressure at the average level of greatest lateral trochanteric projection. The reading is made at the upper border of the brass collar on the metric scale with zero at the fixed arm.

9. Slope of shoulder, right.

Instrument.- Protractor head, leveling platform.

Position of subject.- Identical to that in No. 4, but away from the wall.

Position of observer.- To the right side and in back of the subject.

Procedure.- The wooden blade of the protractor is rested on the intersections of the shoulder line with the neck base and with the armscye. The subject is asked to carry the weight of the instrument on his shoulder without altering the position of his shoulder. The intersection of the shoulder line and the armscye is used as a pivotal





point and the other end of the wooden blade is lowered to the shoulder line - neck base intersection where it rests lightly without depressing the skin surface. The protractor head is rotated until the spirit level indicates that it is horizontal. Before taking the measurement it may be found helpful to show the protractor to the child so that he will not twist to look at it when it is in use. The child should be told that it is important for him to stand still during this measurement.

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During the next four measurements the subject should be asked to try to stand in natural position, quietly, as change of posture will greatly influence the results. The observer should move in relation to the subject, so that the subject's position will be uniform while these measurements are taken.

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10. Width of chest, front.

Instrument.- Tape.

Position of subject.- As in No. 4, but away from the wall.

Position of observer.- In front of the subject with eyes at chest level.

Procedure.- The measurement is taken with the upper border of the tape at the level of the point in the median sagittal plane, midway between the shoulder point of the armscye and the point of lowest extension of the armscye. The tape is parallel to the floor and passes between the right and left armscyes.



11. Length of waist, front.

Instrument.-Tape.

Position of subject.- As in No. 4, but away from the wall.

Position of observer.- As in No. 9.

Procedure.- The tape passes from the neck base to the waist level (center front).

12. Width of chest, back.

Instrument.- Tape.

Position of subject.- As in No. 4, but away from the wall.

Position of observer.- As in No. 9, except in back of subject.

Procedure.- The upper border of the tape passes over the fourth thoracic vertebra, parallel to the floor, between the right and left armscyes.

13. Waist length, back.

Instrument.- Tape.

Position of subject.- As in No. 4, but away from the wall.

Position of observer.- As in No. 11.

Procedure.- The measurement is taken from the neck base to the waist level, center back.

The subject can now be given an interval of relaxation.

14. Girth of chest at the armscye.

Instrument.- Tape.

Position of subject.- Arms are raised slightly to permit the tape to pass under at the level of the armscye on trunk. They are then dropped to the sides. Posture is that which is normal for the individual.



Position of observer.- Behind the subject.

Procedure.- The tape is placed around the trunk without constriction.

The upper border of the tape must rest under the arms at the marked level of the armscye on the trunk. If the subject hunches up his shoulders, he should be asked to relax and consider that the tape is not under his arms. The reading is made at the midpoint of the breathing excursion. Before removing the tape the level of the upper border is marked in the center back.

15. Depth of scye.

Instrument.- Tape.

Position of subject.- As in No. 14, but without raising the arms.

The position should be the individual's normal posture.

Position of observer.- As in No. 14.

Procedure.- The measurement is taken from cervicale to the mark of the upper border of the tape at armscye level.

16. Back arc of the hips.

Instrument.- Tape.

Position of subject.- As in No. 4, but away from the wall.

Position of observer.- In back of the subject with eyes at hip level.

Procedure.- The measurement is taken from the left hip center point across the buttocks to the right hip center point. The upper border of the tape is placed at the average level of greatest trochanteric projection.





17. Maximum chest girth (girls more than 9 years of age and boys more than 10 years of age).

Instrument.- Tape.

Position of subject.- Normal posture. The arms are raised to allow the tape to pass under them and then lowered.

Position of observer.- In front of the subject.

Procedure.- The recorder should be asked to check the back position of the tape. The upper border of the tape should rest at the chest level as marked. The reading is taken without constriction at the midpoint of the breathing excursion.

18. Anterior arc of the chest.

Instrument.- Tape.

Position of subject.- Normal non-fatigue posture. The arms hang loosely at the sides. The observer shall ask the subject to permit him to place the subject's arms in the desired position. This is, with shoulders in normal position, elbows bent slightly and arms raised enough from the trunk to permit the observer to see the midpoints of the underarm. Great care must be taken not to elevate the shoulders, and the position can be manipulated by the observer only if the subject will relax his arms and permit them to be moved while he holds his shoulders steady.

Position of observer.- In front of the subject with eyes at chest level.

Procedure.- The measurement is taken between the two armscye-midpoints at the armscye level.



19. Girth of waist.

Instrument.- Tape.

Position of subject.- Normal non-fatigue, with feet together.

Position of observer.- In front of the subject.

Procedure.- The tape is passed around the body at waist level with the upper border at the waist marks. The recorder should be asked to check the back and side positions if the measurer is unable to do so.

20. Girth of hips at trochanteric level.

Instrument.- Tape.

Position of subject.- Normal non-fatigue, feet together.

Position of observer.- To the right side of the subject with eyes at hip level.

Procedure.- The tape is passed around the body, placing the upper border at the average level of greatest lateral trochanteric projection. It will be found convenient to locate the tape first on the left side and then close the ends over the hip level of the right side.

21. Girth of neck base.

Instrument.- Tape.

Position of subject.- As in No. 19.

Position of observer.- To the right side and in back of the subject.

Procedure.- The tape passes about the neck, its lower border resting on cervicale behind and the markings of the neck base at right and left sides, and in the front.



22. Shoulder length.

Instrument.- Tape.

Position of subject.- As in No. 19.

Position of observer.- To the right side and in back of the subject.

Procedure.- The measurement is taken between the intersections of the shoulder line with the neck base and with the armscye. The child should be cautioned not to drop his shoulder and to stand steadily.

23. Girth of armscye.

Instrument.- Tape.

Position of subject.- As in No. 19. The arm is raised sufficiently to pass the tape under and for the observer to place the margin of the tape against the armscye on the trunk. The arm is then dropped. If the child hugs the tape or hunches his shoulder, he is asked to drop his arm and shoulder as though no tape were there.

Position of observer.- To the right side and in back of the subject.

Procedure.- The two ends of the tape are brought up and crossed over the shoulder without constriction.

24. Girth of the upper arm, right.

Instrument.- Tape.

Position of subject.- Normal non-fatigue. The arm is raised slightly to allow the tape to pass under and is then dropped to the side.

Position of observer.- Facing the subject's right side.

Procedure.- The tape passes around the upper arm midway between shoulder and elbow, without constriction.





25. Girth of elbow, right.

Instrument.- Tape.

Position of subject.- The right arm is lifted slightly from the side and the forearm is flexed at right angles to the upper arm, and extended forward, i.e., in a horizontal position.

Position of observer.- As in No. 24.

Procedure.- The tape passes over olecranon and the line of flexion, bisecting the angle of the lower and upper arms. The reading is taken without constriction.

26. Length of arm, posterior surface; Upper; total.

Instrument.- Tape.

Position of subject.- The right hand is closed to make a fist which is rested on the hip with the dorsal side of the hand anterior and knuckles against the hip.

Position of observer.- To the right side and in back of the subject.

Procedure.- The zero point of the tape is placed at the armscye-shoulder line intersection. It passes over the back of the arm to olecranon, where the first reading is made. A second reading is taken at the point of the distal end of the ulna.

27. Trunk line, right.

Instrument.- Tape.

Position of subject.- Normal non-fatigue. The arms should hang loosely at the sides and the observer will place the right arm in the desired position. Without drawing the shoulder forward or downward, the arm is moved enough forward and outward to permit the observer to see the midpoint of the armscye. Care must be taken not to disturb the shoulder.



Position of observer.- Sitting at the right side of the subject, with eyes at midtrunk level.

Procedure.- The zero point of the tape is placed at the midpoint of the armscye and the distance to the center side waist is read.

28. Waist to hip, right.

Instrument.- Tape.

Position of subject.- Normal, non-fatigue.

Position of observer.- Sitting at right side of the subject with eyes at hip level.

Procedure.- The measurement is taken from center side waist to center side hip.

29. Maximum girth of thigh, right.

Instrument.- Tape.

Position of subject.- Normal non-fatigue posture. Feet about 3 inches apart. It will be found convenient to have younger children stand on a chair. (HOLD the chair while children mount and dismount.)

Position of observer.- At the right side of the subject with eyes at level of gluteal fold.

Procedure.- The tape passes about the thigh, with upper border at the level of gluteal fold and parallel to floor.

30. Maximum girth of calf, right.

Instrument.- Tape.

Position of subject.- Normal non-fatigue posture.

Position of observer.- As in No. 29 except eyes at calf level.



Procedure.- The tape is passed about the calf at the level of largest girth. The plane of the tape is parallel to the floor.

31. Circumference of the knee at tibiale, right.

Instrument.- Tape.

Position of subject.- Normal non-fatigue.

Position of observer.- In front of the subject with eyes at knee level.

Procedure.- The UPPER border of the tape passes over tibiale, parallel to the floor.

32  
and  
33.

Crotch length, total, front.

Instrument.- Tape.

Position of subject.- As in No. 6.

Position of observer.- To the left side and otherwise variable.

Procedure.- The zero point of the metric scale is placed at the center front of the waist. The subject is asked to hold the tape in this position with his index finger. The tape passes down under the crotch and up to the waist point of the center back, where the reading for the total crotch is made. A second reading is taken at the midline of the medial surface of the thigh. The observer's index finger and thumb are slid along the tape, which has been dropped partially from the body to permit this, to the midline of the thigh where the tape is held. The subject then releases the tape in front and the reading for the front rise of the crotch is made when the tape has been removed entirely from the body.





## 34. Extreme bend.

Instrument.- Tape.

Position of subject.- The subject stands with feet together about 18 inches from a chair. He bends over until the trunk is horizontal and grasps the seat or rung of the chair with his hands. His head is allowed to drop forward. His hands should be at the level of his knees. His legs are perpendicular to the floor and straight at the knees.

Position of observer.- Behind the subject and to the right side.

Procedure.- The zero point of the tape is placed at the waist level midway between center back and side. The tape passes over the right buttocks to the back of the knee. The reading is made at the midpoint of the posterior surface of the knee.

35. Trunk girth, vertical.

Instrument.- Tape.

Position of subject.- Normal, non-fatigue. The feet are a few inches apart.

Position of observer.- The observer stands in front of the subject. With small children it is convenient to sit.

Procedure.- The tape is drawn out about 1 meter. The zero end is passed between the ankles and brought up over the right shoulder to meet the other tape end which is brought up from the crotch. On the shoulder, the tape lies midway between the neck base and the armscye. The reading is taken without constriction. Great care should be taken neither to put pressure on the crotch nor to cut the inside of the legs with the tape. When removing the tape, the free end should be allowed to drop to the floor so the child can step away from it before it is sprung closed.



## APPENDIX

## Major Equipment Required by One (1) Measurement Squad\*

Description	Number required	Can be obtained from	Catalog number
Pocket steel tape, 2-meter	1	Lufkin Rule Co., Saginaw, Mich.	146 EM
Pocket linen tape, 2-meter	1	Lufkin Rule Co., Saginaw, Mich.	176 EM
Caliper square, 20-cm without micrometer adjustment.....	1	L. S. Starrett Co., Athol, Mass.	28 M
Protractor head, without blade.....	1	L. S. Starrett Co., Athol, Mass.	491
Health-o-meter weighing scales, portable, white finish.....	1	Continental Scale Co., Chicago, Ill.	140
Wooden anthropometer and large sliding caliper combined.....	2	Bureau of Home Economics, U.S.D.A.	---
Leveling platform, 2 by 3 ft. with set screws, portable.....	1	Joseph Ludewig, 4609 - 30th St., NW., Washington, D.C.	---
Instrument case.....	1	Bureau of Home Economics, U.S.D.A.	---
Clothing:			
Brassieres, girl's knit, cotton.....	Varies with local needs	Boston Knitting Mills, 1350 Broadway, New York, New York	---
Trunks, boy's gym knit, scants.....			603-45

\*Equipment other than clothing purchased by State directors should be shipped by the manufacturer to the Division of Textiles and Clothing, Bureau of Home Economics, United States Department of Agriculture, Washington, D.C. Equipment so received will be tested at the National Bureau of Standards and reshipped by the Bureau of Home Economics to the State director.



## MEMORANDA







